WHAT IS CLAIMED IS:

1. A real time data compression method for a data recorder that sequentially reads a plurality of sampled data points, the method comprising the steps of:

setting the first sampled data point as a starting point X_0;

sequentially examining the plurality of data points, wherein a present data point X_i being examined is determined whether it is in a predetermined tolerable error range; wherein if the present data point X_i is in the predetermined tolerable error range, a previous data point X_{i-1} is ignored;

wherein the previous data point X_{i-1} and the total amount of data points accumulated from the starting point X_0 to the previous data point X_{i-1} are recorded, and the previous data point X_{i-1} is then set as a new starting point, when (a) the present data point X_i exceeds the predetermined tolerable error range or (b) the amount of the ignored data points reaches to a first predetermined amount;

wherein during a period that the sampled data points are varied quickly, and when the amount of the continuously examined data points is less than a second predetermined amount, the total amount of the data points that exceed their respective predetermined tolerable error ranges and the value of each of these data point are recorded.

2. The method as claimed in claim 1, wherein the second predetermined amount is less then the first predetermined amount.

3. The method as claimed in claim 1, wherein the total amount of these data points that are continuously recorded when the sampled data points are

varied quickly is expressed by a negative number.

4. The method as claimed in claim 1, wherein a data format is provided to store all recorded data points, the data format comprising:

a main region composed of multiple segments, wherein each segment has a predetermined length and is provided to store the value of a presented recorded data point and an amount value of the data points calculating from a previous recorded data point to the present recorded data point; and

a secondary region for recording a start time of the examining process, a value of sampling time interval and multiple blocks, wherein each block corresponds to several segment in the main region and includes a time value and a position value respectively representing a start time of the block and the start position of the block.

5. The method as claimed in claim 4, wherein the time parameter of each block is calculated relative to the start time of the examining process and is expressed by multiples of sampling time interval.

6. The method as claimed in claim 4, wherein in a first segment of the main region, the amount value is set to zero.

7. The method as claimed in claim 4, wherein data of all recorded data points is firstly stored in the main region, and then in the secondary region.

8. The method as claimed in claim 5, wherein data of all recorded data points is firstly stored in the main region, and then in the secondary region.

9. The method as claimed in claim 6, wherein data of all recorded data points is firstly stored in the main region, and then in the secondary region.

10. An apparatus for real time data compression applied for a data

recorder, the apparatus comprising:

a processing unit (30) for compressing data by variable compression format based on the stability of the data;

an interface unit (40) connected to the processing unit (30) through an interface, wherein the interface unit (40) further includes a microprocessor and an A/D converter (42) that converts analog measured signals to a digital form and then transmits the digital signals to the microprocessor, whereafter the microprocessor transmits the digital signals to the processing unit (30); and

a storing unit (50) connected to the processing unit (30) through data/address bus for storing the compressed data;

wherein the interface unit (40) is adapted to connect to a measuring device and receives the analog measured signals therefrom, when the analog measured signals are converted into the form of digital, the digital signals are compressed by the processing unit (30) and then stored in the storing unit (50).

11. The apparatus as claimed in claim 10, wherein the processing unit (30) further connects to a real time clock (32) and a flash memory(33), where the real time clock (32) regularly generates an interrupt requirement to inform the processing unit (30) for data recording and compressing.

12. The apparatus as claimed in claim 10, wherein the interface for connection between the processing unit (30) and interface unit (40) is composed of two serial ports (31)(41) that are respectively provided at the processing unit (30) and interface unit (40).

13. The apparatus as clamed in claim 10, wherein the interface unit (40) connect to a measuring device and receives the analog measured signal , and the

processing unit (30) further connects a display unit (60).

14. The apparatus as claimed in claim 10, wherein the storing unit (50) stores the data , the data structure comprising:

a main region composed of multiple segments, wherein each segment has a predetermined length and is provided to store the value of a presented recorded data point and an amount value of the data points calculating from a previous recorded data point to the present recorded data point; and

a secondary region for recording a start time of the examining process, a value of sampling time interval and multiple blocks, wherein each block corresponds to several segment in the main region and includes a time value and a position value respectively representing a start time of the block and the start position of the block.

15. The apparatus as claimed in claim 14, wherein the time parameter of each block is calculated relative to the start time of the examining process and is expressed by multiples of the value of sampling time interval.

16. The apparatus as claimed in claim 10 further comprising a power supply (70) to provide an operating voltage to the processing unit (30), the interface unit (40) and the storing unit (50).